Evaluating Anxiety and Depression in Transgender Patients at The Ohio State University Transgender Primary Care Clinic

Undergraduate Research Thesis

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by

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Abstract

This study evaluated mental health outcomes for transgender patients treated for gender dysphoria at The Ohio State University Transgender Primary Care Clinic (OSUTPCC). The sample included 116 patients (60 natal males and 56 natal females). Mental health was tracked using self-reported questionnaires. We hypothesized that patient mental health would improve overtime under the gender-affirming care of the OSUTPCC. Our analysis indicated no statistically significant trend of improvement for depression and a small, statistically significant trend of improving anxiety over the two-year study period. Neither depression nor anxiety improved at a clinically significant level, warranting alternative interventions. Because of this finding, the clinic will be hiring a mental health professional to be available to our patients and to help guide further improvement of patient care at the OSUTPCC.

Introduction

The transgender population has disproportionately high rates of mental health diagnoses compared to its cisgender counterpart, particularly for depression and anxiety.[1] This disparity is partially due to increased risk factors faced by transgender people: In short, these include increased discrimination, abuse, and isolation.[1,2] Gender dysphoria, which is distress due to the opposition between one's body and one's gender identity, is thought to contribute greatly to depression and anxiety in transgender people.

Within the last 10 years, many medical societies have produced clinical guidelines for treating gender dysphoria with medication and surgery to affirm a gender identity that is different from the sex assigned at birth (gender affirming therapies).[3] Cross-gender hormone therapy (CGHT) is widely accepted as the first line therapy for gender dysphoria. However, treatment of

transgender patients remains controversial, as many of these clinical guidelines are not evidence based, but rather founded on "expert opinion." In addition, many were created with little to no input from mental health professionals.[4] While recent studies have found psychiatric morbidity to improve with gender affirming therapy, most of these studies were descriptive, conducted overseas, or restricted to coastal academic health centers.[5,6] Little quantitative, longitudinal research has been done to evaluate mental health outcomes of this underserved patient population, especially in the Midwest.[7] This study evaluates the existence of a relationship between CGHT and the attenuation of depression and anxiety in a Midwestern, transgender, single-center patient population.

Terminology

Gender identity: an internal definition of oneself as a particular gender, regardless of one's appearance. Gender identity does not necessarily follow one's anatomy or appearance. For example, someone with female genitalia and breasts may not identify as a woman.[3]

Gender expression: a set of behaviors that reflect the socially defined description of masculine and feminine. These behaviors are independent of gender identity. For example, someone may appear feminine when in fact they identify as a man.[3]

Sex: a description of someone's anatomy. While this term often refers to male versus female, there are a variety of differences in sexual development (DSD) which account for the presence, absence, or the extent of differentiation of internal and external genitals.[3]

Differences in Sexual Development (DSD): A phenotypic variant that does not align with society's definition of male or female. This difference can be anatomical, hormonal, or

chromosomal. The term “DSD” does not define someone’s gender identity. People who have differences in sexual development are said to be “affected by DSD” or simply DSD-affected.[3]

Sexual orientation: a set of behaviors, sexual attraction, or romantic feelings for a sex, gender identity, gender expression, or any combination of these.[3]

Intersex: A gender nonconforming identity for DSD-affected people who do not see themselves fully defined as either male or female. This term, along with “hermaphrodite,” is considered outdated by some people in the medical community, however many people still identify as intersex. Intersex is represented as “I” in the LGBTQI gender and sexual minority acronym.[3]

Transsexual: A term used to describe a transgender person who has undergone genital reassignment surgery (GRS). This term is also considered antiquated in the medical community and pejorative to many transgender people. Transgender people who wish to describe the status of their genitals more frequently use the terms “preoperative” or “postoperative.” These terms are only used in the context of genital reassignment surgery and should not be used otherwise, as they imply that GRS is something that all transgender people will elect to do (which is not the case).[3]

Drag: While this term is not relevant to this article, it is important to define for readers who find the distinction between transvestite, drag queen, and transgender to be confusing. Drag is a performative expression of gender. This means that the person “in drag” is portraying a gender with which they do not necessarily identify. There are many instances when trans men or trans women will participate in drag shows, however gender expression of the person in drag is generally hyperfeminized or hypermasculinized because drag is meant to be performative.[3]

Transvestite: this term used to refer to a cross-dressing person, but it is now considered pejorative.[3]

Cross-dressing: the act of wearing clothing, jewelry, or makeup that is not normally associated with someone's anatomical sex. People who engage in cross-dressing generally have no desire to change their anatomical sex. Reasons for cross dressing include performance (drag), a need to express masculinity or femininity, or for sexual enjoyment. Transgender people who are wearing the clothes that match their gender identity are not cross-dressing.[3]

Transgender: A term used to describe someone whose gender identity does not match their sex assigned at birth. Someone who was assigned female at birth and identifies as a man is termed a "trans man." Likewise, someone who was assigned male at birth and identifies as a woman is termed a "trans woman." In the medical community trans women are often called male-to-female (MTF) and trans men are called female-to-male (FTM). Additionally, "**trans**" alone (without the addition of man or woman after) can be used to include gender queer and gender nonconforming individuals who do not identify as either gender. In contrast, "**cisgender**" is a term used to describe someone whose sex assigned at birth aligns with their gender identity.[3]

Gender nonconforming: a description of someone whose gender identity does not match their sex assigned at birth. This term is broader than transgender, referring to a someone whose gender identity may be more complex, fluid, or less clearly defined than the term transgender.[3]

Genderqueer: A term used to encompass a range of gender nonconforming identities. Genderqueer can be used to classify people who identify with multiple genders, no gender at all, or do not identify within the cis-trans or male-female binaries. People who identify as Genderqueer often use gender neutral pronouns or switch between "he/him" and "she/her."[3]

Gender Dysphoria: Formerly "gender identity disorder," the DSM-5's designation for significant distress due to an incongruence between someone's gender identity and their body, lasting for at least six months.[8]

Gender Affirming Surgery: an umbrella term for any surgery used to treat gender dysphoria.[3]

Genital Reconstruction Surgery (GRS): This term is colloquially referred to as "bottom surgery." It refers to any number of surgeries that alter the anatomy of someone's genitals to better match the expectations of the gender they identify as. Male to female GRS may include penectomy, orchiectomy, vaginoplasty, clitoroplasty, and labiaplasty. Female to male GRS may include hysterectomy, oophorectomy, metoidioplasty, phalloplasty, vaginectomy, scrotoplasty, testicular prosthesis, and erectile prosthesis.[3]

Top Surgery: a colloquial term used to mean either a mastectomy (for trans men) or a breast augmentation (for trans women).[3]

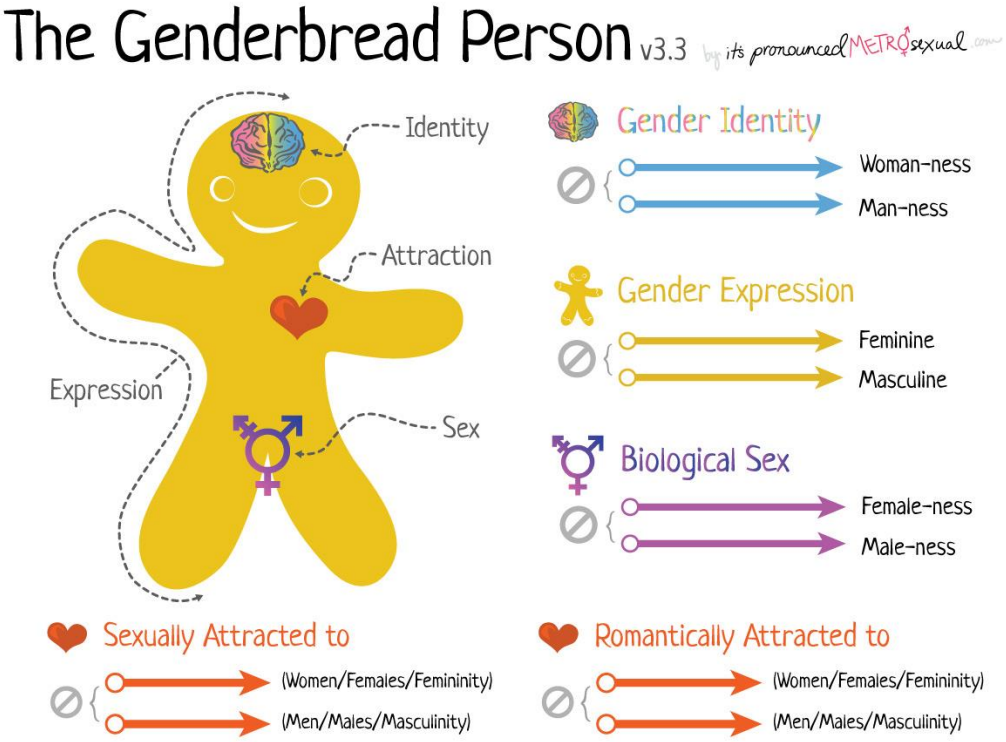


Figure 1. The Genderbread Person, a visualization of commonly confused terminology related to gender, sex, and sexual orientation.[9]

Background

Prevalence

Though the concept of "transgender" only arose within the last several decades, gender variance and diversity have existed across all human history.[10] In 2007, it was estimated that the lower bound of the prevalence of transgender people was about 0.2% of the US population, or about 1 in 500 people.[11] The most recent estimate of transgender prevalence is 0.58% of the US population, or about 1 in 173 people.[12] Research on transgender populations has risen exponentially over the last 20 years (see Figure 2), albeit most studies have been limited to coastal academic health centers and European populations.[5,6]

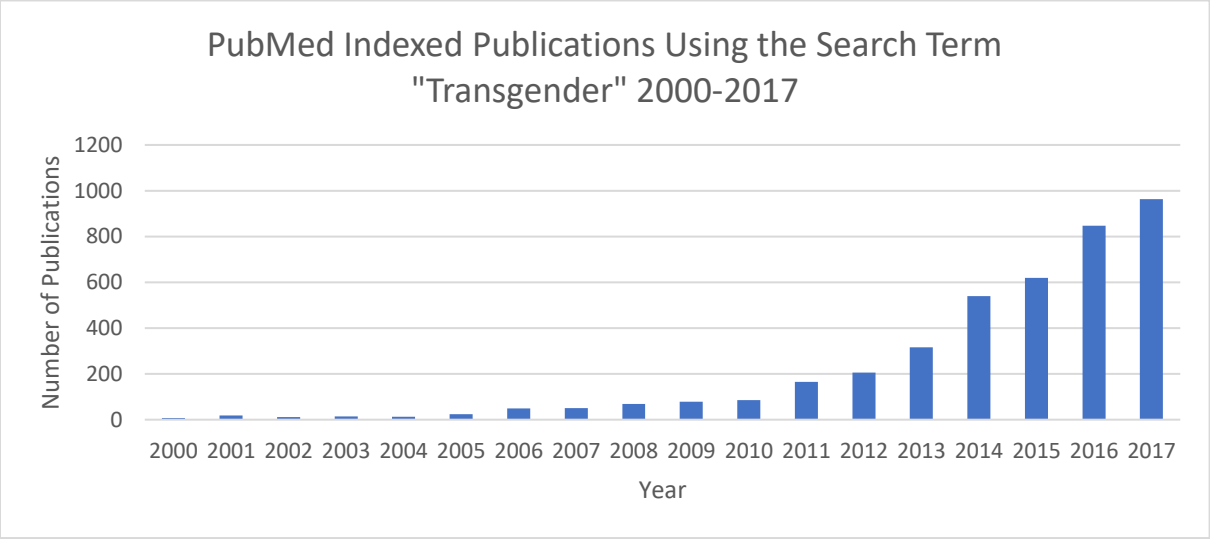


Figure 2. Demonstrating the exponential growth of transgender research over the last 17 years.[13]

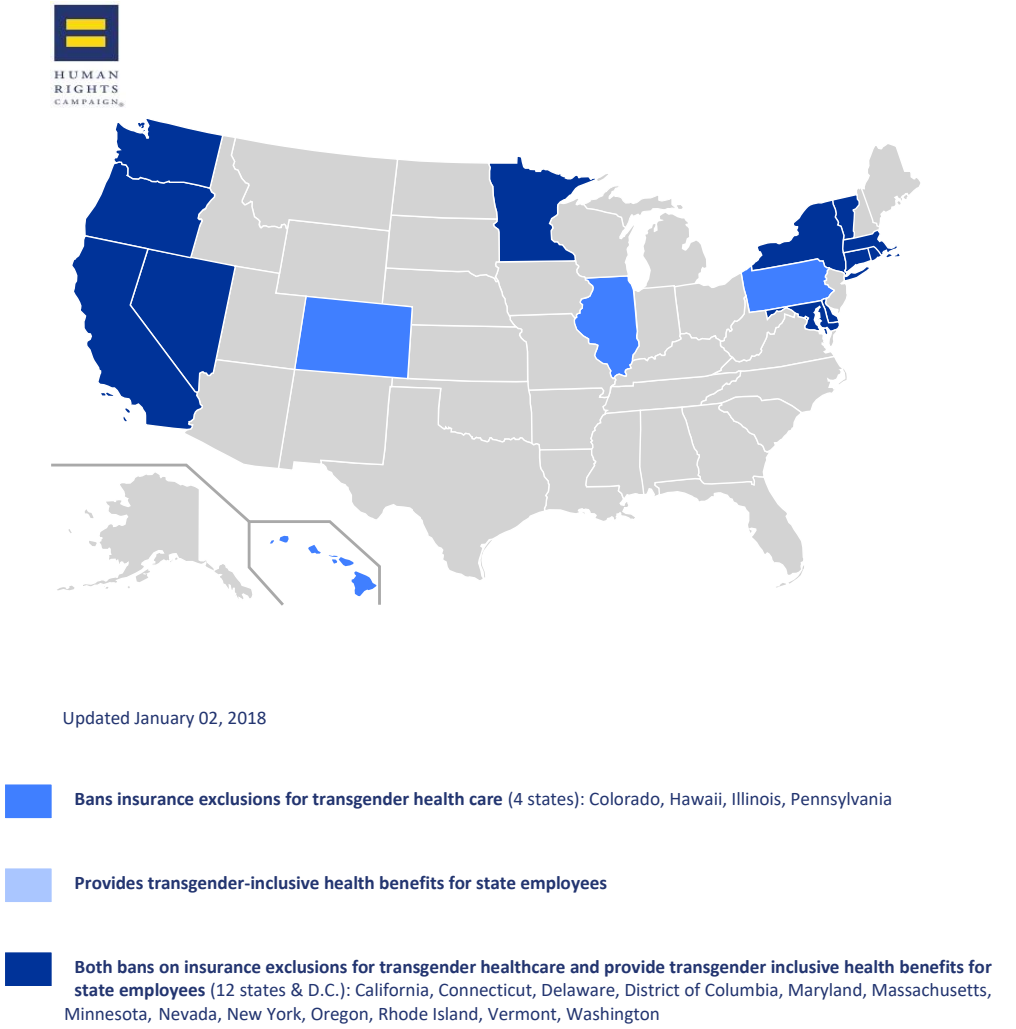


Figure 3. Illustration of the current climate of state insurance policies for transgender care.[14]

Barriers to care

Accessing healthcare can be extremely difficult for transgender people. Well known factors that contribute to this problem include high rates of discrimination in healthcare settings, lack of knowledgeable providers, exclusion of transition-related care from health insurance, and inability to pay for the cost of care.[3] The Report of the 2015 US Transgender Survey found more than half of transgender patients who were seeking coverage for gender affirming care were denied and a quarter of patients seeking coverage specifically for hormones alone were denied.[1] In addition, the survey found that one third of transgender people did not see a doctor when they

needed to because they could not afford it.[1] This may be due to the fact that transgender people are much less likely than the general population to have health insurance.[3]

Gender-affirming therapies, such as hormones and surgery, are widely used in the transgender population. Some estimates suggest that as much as 60% of the adult transgender population have used cross-gender hormone therapy (CGHT) at some point in their life.[3] Nevertheless, many transgender patients do not choose to undergo surgery or initiate CGHT as part of their transition.[3] This reflects a somewhat recent paradigm shift in the medical community, as in the past, transitioning and gender affirming therapy required both CGHT and surgery, treating gender as a strict binary and not acknowledging gender as a spectrum.[15,16]

The most widely used guidelines for treating transgender patients are the Standards of Care (SOC) for the Health of Transsexual, Transgender, and Gender Nonconforming People from the World Professional Association for Transgender Health (WPATH).[3,16] The earliest versions of these guidelines included eligibility requirements for transgender patients seeking to transition. These requirements followed an older model for transition known as “triadic therapy,” which involved a period of living as the opposite gender along with psychotherapy before patients were allowed to receive hormones and surgery.[3,15] These requirements were highly restrictive and held transgender patients to a much higher standard than cisgender patients for comparably irreversible therapies. The most recent editions of these guidelines no longer include readiness criteria for gender-affirming therapies, increasing patient autonomy and ability to transition.

The Ohio State University Transgender Primary Care Clinic

The Ohio State University Transgender Primary Care Clinic (OSUTPCC) uses an informed consent model for gender-affirming therapy. The informed consent model asserts that a patient has the right to access CGHT if they are able to make an informed decision about the risks and benefits of the treatment.[3] This change is reflected in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) which replaced gender identity disorder with gender dysphoria, no longer pathologizing the transgender identity, but rather regarding it as a natural gender variant. This removes the requirement of psychotherapy before obtaining CGHT, as it is an unnecessary barrier for many transgender patients. WPATH has deemed informed consent models to be consistent with the SOC, despite the latest edition's increased emphasis on the role of the mental health professional in the care of transgender people.[16]

The WPATH criteria for hormone therapy are as follows:

1. Persistent, well-documented gender dysphoria;

2. Capacity to make a fully informed decision and to consent for treatment;

3. Age of majority in a given country;

4. If significant medical or mental health concerns are present, they must be reasonably well controlled.[16]

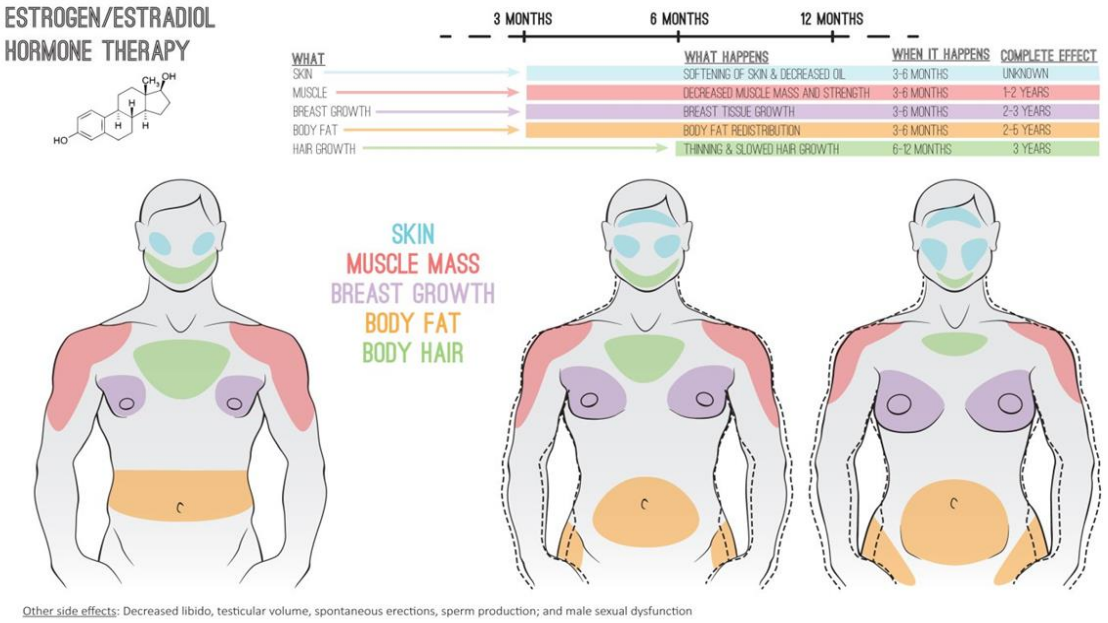
The fourth criterion is not well defined, leaving the provider with a range of possible interpretations. The SOC notes that comorbid mental health concerns do not preclude patients from accessing CGHT, but rather they must be managed prior to or concurrent with treatment.[16] Transitioning can be physically and socially stressful for many patients. For many patients whose

depression or anxiety is not related to their gender, delaying CGHT is done to mitigate the possibility of worsening overall distress.[16] On the other hand, delaying CGHT can itself be a stressor for transgender patients.[16] Transgender patients often initiate hormones themselves because hormone analogues are readily available for purchase on the street or on the internet.[17] This can be very dangerous, as hormones do have serious adverse effects for some people and thus should always be taken under the guidance of a medical professional.

Physicians of the OSUTPCC reference both the WPATH SOC and the Guidelines for the Primary and Gender-Affirming Care of Transgender and Gender Nonbinary People from the Center of Excellence for Transgender Health at the University of California, San Fransisco. Upon entrance to the OSUTPCC, patients are provided with a transgender-specific intake form, where they are asked about their preferred name, gender identity, sex assigned at birth, demographic information, sexual history/sexual orientation (for sexually transmitted infection screening purposes), goals for transition, history of hormone use, plans for biological children (because CGHT may impact fertility), social acceptance status, and mental health history. Baseline laboratory tests are usually performed, which may include a complete blood count, lipid profile, comprehensive metabolic panel, prolactin level (usually only for trans women who are already on CGHT), and STI screenings. Physicians at the OSUTPCC take a medical history, assess mental health issues, provide referrals, educate patients about the risks and benefits of CGHT, and assess the patient's ability to provide informed consent.

Currently, the OSUTPCC only delays CGHT for patients with mental health concerns if the following criteria are met: the patient does not have access to a mental health professional, has no social support system, and has significant depression or anxiety. In an effort to reduce harm, OSUTPCC physicians prescribe hormones for transgender patients who are either

currently taking hormone analogues or demonstrate an inability to delay CGHT, despite relative contraindications. Patients started on CGHT usually begin to see changes at around 3 months (see Figure 4).



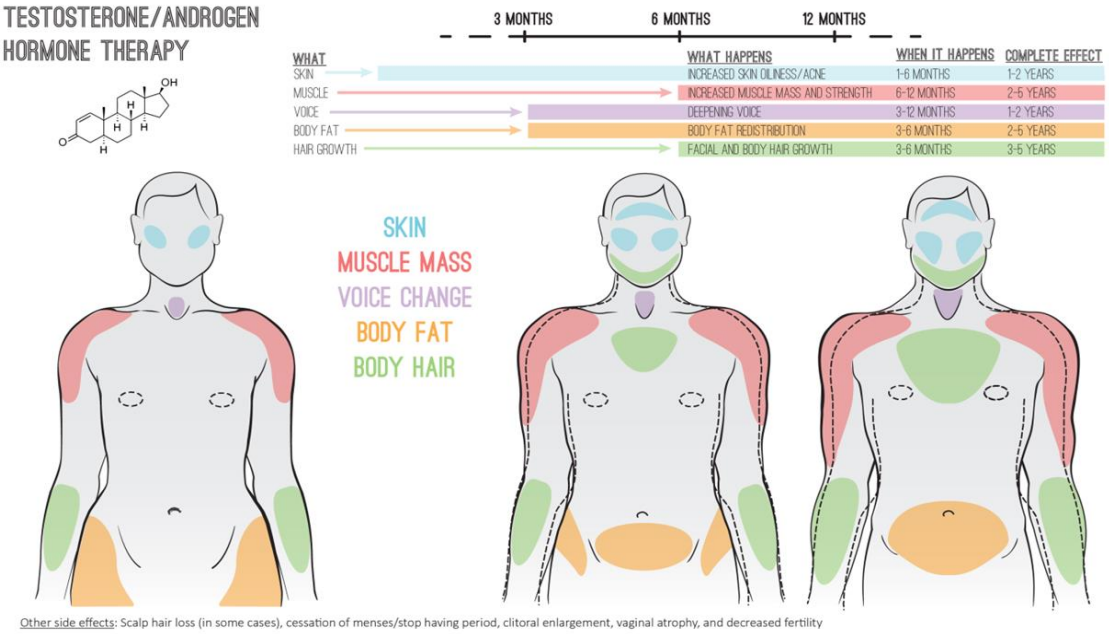


Figure 4. Timeline of Physical Changes on Cross-Gender Hormone Therapy.[18,19]

For feminizing CGHT, estrogen and spironolactone (an androgen blocker) are initiated at a low dose and incrementally increased if follow-up laboratory tests show the patient can tolerate the therapy. Finasteride is also prescribed sometimes as an additional androgen blocker. Masculinizing CGHT is also initiated at a low dose and incrementally increased as tolerated.

Physicians at the OSUTPCC are deeply invested in improving the quality of care they provide. This study aims to answer several questions that will help guide the clinic towards improving patient care: Is there an improvement of psychopathology over time at the OSUTPCC; what factors are correlated with improved mental health outcomes; and does the clinic need to provide additional resources to its patients?

Methods

IRB approval was granted for this study (study 2017E0086) by the Privacy Board for the HIPAA waiver exemption on June 21, 2017. Protocol for study 2017E0086 was then amended to include mental health diagnoses and psychiatric medication and submitted for IRB approval on August 9, 2017. The study ID was changed to 2017E0516 and was approved by the Privacy Board for the HIPAA waiver exemption on August 10th, 2017. Previously, Dr. Maria Barnett was the PI listed through the IRB, however, she left her position at The Ohio State University Wexner Medical Center and thus no longer held a faculty position. While Dr. Barnett was still treating patients through The Ohio State University Transgender Primary Care Clinic (OSUTPCC), Dr. Melissa Davis, replaced her as the PI on study 2017E0516 and as my advisor on this project.

The protocol for data collection was constructed over the course of several meetings held during the OSUTPCC clinic hours with the help of Dr. Andrew Keaster, one of the founding physicians of the OSUTPCC. It was decided that we would secure data by recording it in the data capturing software known as "REDcap" on password protected computers. A patient panel pool was built in the electronic medical record "EPIC" to gather all identifiable information in compliance with HIPAA and OSU policy in order to prevent a data breach. A data warehouse mining request was completed to access patient information on EPIC from patients seen at the OSUTPCC from January 1, 2015 – February 1st, 2017 at Care Point East.

The REDcap tool was constructed between June and October, 2017. The data coding protocol was tested on several patients once the data warehouse mining request was complete. Once several patients' data had successfully been coded, the REDcap tool was published, and data entry began. Data entry was completed on December 28, 2017.

Data for this study were collected from the charts of transgender patients who established care with the OSUTPCC within the clinic's first 25 months (January 1st, 2015 through February 1st, 2017). To qualify for this study, subjects were required to have at least two mental health screening events within the study period. Out of 173 patients who established care within the timeline of the study, 116 qualified for analysis.

Data collected were patient information routinely recorded at initial and follow up visits to the clinic. Demographic and social history included in our analysis were as follows: age, race, history of verbal or physical abuse, reported family acceptance/social support at entrance to the clinic, sex assigned at birth, gender identity, and any history of gender affirming therapy prior to our clinic. Psychiatric diagnosis and psychoactive medication at entry to clinic were recorded for each subject as well as any changes to psychiatric diagnosis within our study period. Biometric

data (height and weight) and mental health data (7-item Generalized Anxiety Disorder Scale and the 9-item Patient Health Questionnaire scores) collected at every patient visit were assessed for significant trends.

The 7-item Generalized Anxiety Disorder Scale (GAD-7) is a self-reported questionnaire that measures anxiety severity and may be used to aid an anxiety diagnosis. The questionnaire scores can range from unremarkable anxiety (0-4), mild anxiety (5-9), moderate anxiety (10-14), to severe anxiety (15-21).[20,21] Similarly, the 9-item Patient Health Questionnaire (PHQ-9) can be used for the diagnosis of depression and measurement of depression severity.[21] The GAD-7 and the PHQ-9 mental health screening questionnaires were selected as survey tools for this study because they have been regularly implemented at the OSUTPCC. Both the GAD-7 and the PHQ-9 have been rigorously tested and found to be valid self-reported measures of anxiety and depression, respectively.[21-23]

We used a Wilcoxon signed rank test to evaluate shifts in the distribution of mental health trends between dichotomous groups of patients. This test was used preferentially over a paired t-test because we could not assume a normal distribution for either the GAD-7 or PHQ-9 scores. Because the Wilcoxon signed rank test assumes a continuous distribution, we adjusted a continuity correction to approximate the discrete distribution of mental health scores with a continuous one. The effect of non-dichotomous groups on the distribution of mental health trends was evaluated with a Kruskal-Wallis rank sum test.

Results

Demographic Information

Table 1. Baseline Characteristics	n, %
Age (yrs) at entry to clinic	29.1 (mean)
Sex	
Natal Female	56, 48.3%
Natal Male	60, 51.7%
DSD	0, 0.0%
Gender Identity	
Male	53, 45.7%
Female	57, 49.1%
Genderqueer	6, 5.2%
Race	
Native Hawaiian or Pacific Islander	1, 0.9%
Black or African American	17, 14.7%
White	94, 81.0%
Unknown / Not Reported	4, 3.4%
Multiracial	1, 0.9%
Victims of Verbal or Physical Abuse	48, 41.4%
Family acceptance and social support	
Accepted by family	58, 50.0%
Somewhat accepted by family	15, 12.9%
Not accepted by family	27, 23.3%
Not out to family	4, 3.4%
Not out to friends	1, 0.9%
Unknown social support	13, 11.2%
Employment	
Employed	84, 72.4%
Unemployed	32, 27.6%
Unknown Employment	1, 0.9%

Table 2. Hormone/Psychiatric Profile	n, %
Has the patient used hormones prior to their first visit to OSUTPCC?	Yes (47, 40.5%), No (69, 59.5%)
If yes, has the patient used hormones within three months prior to their first visit?	Yes (35, 74.5%), No (8, 17.0%), Unknown (4, 8.5%)
Was the patient started on hormone therapy or had their hormone therapy continued by the clinic?	Yes (114, 98.3%), No (2, 1.7%)
Has the patient undergone previous surgical intervention for treatment of gender dysphoria?	Yes (5, 4.3%), No (105, 90.5%), Unknown (6, 5.2%)
Psychiatric Diagnosis at Entrance to Clinic	Depression (58, 50.0%), Anxiety (40, 34.5%), Other psychiatric diagnosis (43, 37.1%), None (34, 29.3%)
Did psychiatric diagnosis change by February 1, 2017?	Yes (10, 8.6%), No (106, 91.4%)
New Psychiatric Diagnosis as of February 1, 2017	Depression (4, 40.0%), Anxiety (4, 40.0%), Other psychiatric diagnosis (4, 40.0%),
Psychiatric Medications at Entry to Clinic	SSRI (23, 19.8%), SNRI (4, 3.4%), DNRI (9, 7.8%), TCA (4, 3.4%), Mood Stabilizer (12, 10.3%), Antipsychotic (10, 8.6%), Stimulant (8, 6.9%), Other (12, 10.3%), None (61, 52.6%)
Was the patient prescribed psychiatric medications after entry to the clinic?	Yes (25, 21.6%), No (91, 78.4%)

The OSUTPCC saw 173 patients between January 1st, 2015 through February 1st, 2017. Of these patients, 116 had at least two mental health screenings within this period, qualifying them for analysis. The mean age at entry to the clinic was 29.1 with a standard deviation of 11.64. 60 (51.7%) patients were natal males and 56 (48.3%) patients were natal females. No patients in our sample were DSD affected. 53 patients (45.7%) identified as male, 57 patients (49.1%) identified as female, and 6 patients (5.2%) identified as either gender nonbinary or gender queer.

The majority of OSUTPCC patients were white (81%), 14.7% were black, 1 patient was native American, 1 patient was multiracial, and 4 did not report their race. 48 (41.4%) patients reported being a victim of physical or verbal abuse because of their gender identity.

58 (50%) patients reported being accepted by their family, 15 (12.9%) reported being somewhat accepted by family, 27 (23.3%) reported that they were not accepted by their family, 4 (3.4%) reported they were not "out" to their family, 1 (0.9%) reported they were not "out" to friends, 13 (11.2%) did not report their social support. 84 (72%) reported either being in school or employed. 32 (27.6%) reported being unemployed and 1 patient (0.9%) did not report their employment status.

Most patients had never been on CGHT (59.5%), and all but one of these patients were started on CGHT by the clinic. Of the patients who have prior experience on CGHT, 35 (74.5%) had reported using cross sex hormones within three months prior to their first visit to the OSUTPCC. 8 (17%) had reported no CGHT within three months prior to their first visit, and 4 (8.5%) had unknown cross sex hormone use. All but one patient had their CGHT continued by the clinic. Most patients (90.5%) reported to have no surgical intervention for the treatment of gender dysphoria prior to their first visit.

At entry to the clinic, 58 (50%) were diagnosed with depression, 40 (34.5%) were diagnosed with anxiety, 43 (37%) had some other psychiatric diagnosis, and 34 (29.3%) had no psychiatric diagnosis. 10 patients had their psychiatric diagnosis change during the study period; 4 were diagnosed with depression, 4 were diagnosed with anxiety, and 4 were diagnosed with some other psychiatric diagnosis.

At entrance to the clinic, 23 (19.8%) were on a SSRI (selective serotonin reuptake inhibitor), 4 (3.4%) were on a SNRI (serotonin norepinephrine reuptake inhibitor), 9 (7.8%) were on a DNRI (dopamine norepinephrine reuptake inhibitor), 4 (3.4%) were on a TCA (tricyclic antidepressant), 12 (10.3%) were on a mood stabilizer, 10 (8.6%) were on an antipsychotic medication, 8 (6.9%) were on a stimulant, 12 (10.3%) were on some other psychiatric medication, and 61 (52.6%) were not on any psychiatric medication. 25 (21.6%) patients were prescribed a new or different psychiatric medication within the study period.

Wilcoxon rank sum findings

Variable	**Average Difference in Anxiety (measured in points on the GAD-7 scale)**	**95% Confidence Interval (measured in points on the GAD-7 scale)**	**Statistic (W)**	**P-value**
Previous hormone use	-1.0	-3.0 to 1.0	907.5	0.23
Gender affirming surgery	2.0	-6.0 to 8.0	169.5	0.96
a victim of physical or verbal assault	4.9×10^(-5)	-1.0 to 2.0	1115.5	0.74
Employment status	5.9×10^(-5)	-2.0 to 2.0	805	0.91
Depression diagnosis	1.0	-1.0 to 3.0	1183.5	0.54
Anxiety diagnosis	1.5	-9.6×10^(-5) to 4.0	1210.5	0.13
Diagnosis of other psychiatric condition	9.2×10^(-6)	-2.0 to 2.0	980.5	0.76
No psychiatric diagnosis	2.3×10^(-5)	-2.0 to 2.0	970.5	0.93
Change in psychiatric diagnosis	3.0×10^(-5)	-4.0 to 3.0	371	0.89

Table 3. Wilcoxon Rank Sum Tests: Comparing differences in GAD-7 distributions by dichotomous demographic variables.

Variable	**Average Difference in Depression (measured in points on the PHQ-9 scale)**	**95% Confidence Interval (measured in points on the PHQ-9 scale)**	**Statistic (W)**	**P-value**
Previous hormone use	0	-2.0 to 2.0	1081	0.94
Gender affirming surgery	-1.7×10^(-6)	-6.0 to 7.0	169.5	0.96
a victim of physical or verbal assault	-6.1×10^(-5)	-2.0 to 1.0	1051	0.76
Employment status	9.1×10^(-5)	-2.0 to 2.0	780	0.84
Depression diagnosis	7.4×10^(-5)	-2.0 to 1.0	1143.5	0.91
Anxiety diagnosis	1.0	-1.0 to 2.0	1157.5	0.41
Diagnosis of other psychiatric condition	1.0	-1.0 to 2.0	1067.5	0.45
No psychiatric diagnosis	3.2×10^(-5)	-2.0 to 1.0	934	0.74
Change in psychiatric diagnosis	-1.0	-4.0 to 2.0	349	0.63

Table 4. Wilcoxon Rank Sum Tests: Comparing differences in PHQ-9 distributions by dichotomous demographic variables.

The difference between patients with previous hormone use and patients with no previous hormone use in anxiety scores was -1.0 points on the GAD-7 scale, with a 95% C.I. (-3.0 to 1.0 points). The V statistic was 907.5 with an associated p-value of 0.23. The difference between patients with previous hormone use and patients with no previous hormone use in depression scores was 0 points on the PHQ-9 scale, with a 95% C.I. (-2.0 to 2.0 points). The W statistic was 1081 with an associated p-value of 0.94.

The difference in anxiety scores between patients who had gender affirming surgery at entrance to the clinic and patients who did not have gender affirming surgery prior to their first clinic visit was 2.0 points on the GAD-7 scale, with a 95% C.I. (-6.0 to 8.0 points). The W statistic was 196 with an associated p-value of 0.61. The difference in depression scores between patients who had gender affirming surgery at entrance to the clinic and patients who did not have gender affirming surgery prior to their first clinic visit was -1.7×10^{-6} points on the PHQ-9 scale, with a 95% C.I. (-6.0 to 7.0 points). The W statistic was 169.5 with an associated p-value of 0.96.

The difference in anxiety scores between patients who reported being a victim of physical or verbal assault due to their gender identity and patients who did not was 4.9×10^{-5} points on the GAD-7 scale, with a 95% C.I. (-1.0 to 2.0 points). The W statistic was 1115.5 with an associated p-value of 0.74. The difference in depression scores between patients who reported being a victim of physical or verbal assault due to their gender identity and patients who did not was -6.1×10^{-5} points on the PHQ-9 scale, with a 95% C.I. (-2.0 to 1.0 points). The W statistic was 1051with an associated p-value of 0.76.

The difference in anxiety scores between patients who were employed and patients who were unemployed was 5.9×10^{-5} points on the GAD-7 scale, with a 95% C.I. (-2.0 to 2.0 points). The W statistic was 805 with an associated p-value of 0.91. The difference in depression scores between patients who were employed or in school and patients who were unemployed was 9.1×10^{-5} points on the PHQ-9 scale, with a 95% C.I. (-2.0 to 2.0 points). The W statistic was 780 with an associated p-value of 0.84.

The difference in anxiety scores between patients who were diagnosed with depression at entry to the clinic and patients who were not was 1.0 points on the GAD-7 scale, with a 95% C.I. (-1.0 to 3.0 points). The W statistic was 1183.5 with an associated p-value of 0.54. The difference in depression scores between patients who were diagnosed with depression at entry to the clinic and patients who were not was 7.4×10^{-5} points on the PHQ-9 scale, with a 95% C.I. (-2.0 to 1.0 points). The W statistic was 1143.5 with an associated p-value of 0.91.

The difference in anxiety scores between patients who were diagnosed with anxiety at entry to the clinic and patients who were not was 1.5 points on the GAD-7 scale, with a 95% C.I. (-9.6×10^{-5} to 4.0 points). The W statistic was 1210.5 with an associated p-value of 0.13. The difference in depression scores between patients who were diagnosed with anxiety at entry to the clinic and patients who were not was 1.0 point on the PHQ-9 scale, with a 95% C.I. (-1.0 to 2.0 points). The W statistic was 1157.5 with an associated p-value of 0.41.

The difference in anxiety scores between patients who were diagnosed with a psychiatric condition other than depression or anxiety at entry to the clinic and patients who were not was 9.2×10^{-6} points on the GAD-7 scale, with a 95% C.I. (-2.0 to 2.0 points). The W statistic was 980.5 with an associated p-value of 0.76. The difference in depression scores between patients who were diagnosed with a psychiatric condition other than depression or anxiety at entry to the clinic and patients who were not was 1.0 point on the PHQ-9 scale, with a 95% C.I. (-1.0 to 2.0 points). The W statistic was 1067.5 with an associated p-value of 0.45.

The difference in anxiety scores between patients who were not diagnosed with any psychiatric condition at entry to the clinic and patients who were was 2.3×10^{-5} points on the GAD-7 scale, with a 95% C.I. (-2.0 to 2.0 points). The W statistic was 970.5 with an

associated p-value of 0.93. The difference in depression scores between patients who were not diagnosed with any psychiatric condition at entry to the clinic and patients who were was 3.2×10^{-5} points on the PHQ-9 scale, with a 95% C.I. (-2.0 to 1.0 points). The W statistic was 934 with an associated p-value of 0.74.

The difference in anxiety scores between patients who had their psychiatric diagnosis change after entry to the clinic and patients who did not was 3.0×10^{-5} points on the GAD-7 scale, with a 95% C.I. (-4.0 to 3.0 points). The W statistic was 371 with an associated p-value of 0.89. The difference in depression scores between patients who had their psychiatric diagnosis change after entry to the clinic and patients who did not was -1.0 point on the PHQ-9 scale, with a 95% C.I. (-4.0 to 2.0 points). The W statistic was 349 with an associated p-value of 0.63.

Wilcoxon Signed Rank Findings

Variable	Median Difference	95% Confidence Interval	Statistic (V)	P-value
first and last anxiety scores	-1.5 points on the GAD-7 scale	-2.999 to-7.999×10^(-6) points	989	0.021
the first and last depression scores	-5.5×10^(-5) points on the PHQ-9 scale	-1.0 to 1.0 points	1387	1.0
first and last weight recordings	0.95 kg	0.15 to 1.8 kg	3325.5	0.020

Table 5. Wilcoxon Signed Rank Tests: Comparing differences between first and last measurements.

The median difference between the first and last anxiety scores was -1.5 points on the GAD-7 scale, with a 95% C.I. (-2.999 to -7.999×10^{-6} points). The V statistic was 989 with an associated p-value of 0.021.

The median difference between the first and last depression scores was -5.5×10^{-5} points on the PHQ-9 scale, with a 95% C.I. (-1.0 to 1.0 points). The V statistic was 1387 with an associated p-value of 1.

The median difference between the first and last weight recordings within the study period was 0.95 kg, with a 95% C.I. (0.15 to 1.8 kg). The V statistic was 3325.5 with an associated p-value of 0.020.

Kruskal-Wallis Chai Square Analysis

Variable	**Statistic (H)**	**Degrees of Freedom**	**P-value**
Age	6.5	3	0.090
Gender	1.8	2	0.41
Race	0.40	1	0.53
Family Acceptance	5.4	3	0.14
SSRI	5.4	1	0.020
SNRI	1.5	1	0.22
DNRI	1.0	1	0.31
TCA	1.8	1	0.18
Mood stabilizer	0.028	1	0.86
Antipsychotic	1.2	1	0.28
Stimulant	0.20	1	0.66
No Psychiatric Medications	0.080	1	0.77

Table 6. Kruskal-Wallis Tests: Comparing differences in GAD-7 distributions by non-dichotomous demographic variables.

Key: SSRI= selective serotonin reuptake inhibitor; SNRI= serotonin norepinephrine reuptake inhibitor; DNRI= dopamine norepinephrine reuptake inhibitor; TCA= tricyclic antidepressant

Variable	**Statistic (H)**	**Degrees of Freedom**	**P-value**
Age	4.7	3	0.19
Gender	0.26	2	0.88
Race	0.0099	1	0.92
Family Acceptance	5.4	3	0.10
SSRI	4.3	1	0.038
SNRI	0.17	1	0.68
DNRI	0.45	1	0.50
TCA	4.0	1	0.047
Mood stabilizer	0.012	1	0.91
Antipsychotic	0.62	1	0.43
Stimulant	0.67	1	0.41
No Psychiatric Medications	0.029	1	0.87

Table 7. Kruskal-Wallis Tests: Comparing differences in PHQ-9 distributions by non-dichotomous demographic variables.

Key: SSRI= selective serotonin reuptake inhibitor; SNRI= serotonin norepinephrine reuptake inhibitor; DNRI= dopamine norepinephrine reuptake inhibitor; TCA= tricyclic antidepressant

A Kruskal-Wallis chi-squared test was performed to determine whether the distribution of anxiety over time was different between age groups. Age did not appear to play a significant role in determining the distribution of GAD-7 trends. The H statistic was 6.5, with 3 degrees of freedom and an associated p-value of 0.090.

A Kruskal-Wallis chi-squared test was performed to determine whether the distribution of depression over time was different between age groups. Age did not appear to play a significant role in determining the distribution of PHQ-9 trends. The H statistic was 4.7, with 3 degrees of freedom and an associated p-value of 0.19.

A Kruskal-Wallis chi-squared test was performed to determine whether the distribution of anxiety over time was different between gender groups. Gender did not appear to play a significant role in determining the distribution of GAD-7 trends. The H statistic was 1.8, with 2 degrees of freedom and an associated p-value of 0.41.

A Kruskal-Wallis chi-squared test was performed to determine whether the distribution of depression over time was different between gender groups. Gender did not appear to play a significant role in determining the distribution of PHQ-9 trends. The H statistic was 0.26, with 2 degrees of freedom and an associated p-value of 0.88.

A Kruskal-Wallis chi-squared test was performed to determine whether the distribution of anxiety over time was different between race groups. Race did not appear to play a significant role in determining the distribution of GAD-7 trends. The H statistic was 0.40, with 1 degree of freedom and an associated p-value of 0.53.

A Kruskal-Wallis chi-squared test was performed to determine whether the distribution of depression over time was different between race groups. Race did not appear to play a

significant role in determining the distribution of PHQ-9 trends. The H statistic was 0.0099, with 1 degree of freedom and an associated p-value of 0.92.

A Kruskal-Wallis chi-squared test was performed to determine whether the distribution of anxiety over time was different between groups with different levels of social support. Acceptance by family did not appear to play a significant role in determining the distribution of GAD-7 trends. The H statistic was 5.4, with 3 degrees of freedom and an associated p-value of 0.14.

A Kruskal-Wallis chi-squared test was performed to determine whether the distribution of depression over time was different between groups with different levels of social support. Acceptance by family did not appear to play a significant role in determining the distribution of PHQ-9 trends. The H statistic was 5.4 with 3 degrees of freedom and an associated p-value of 0.10.

A Kruskal-Wallis chi-squared test was performed to determine whether the distribution of anxiety over time was different between groups on different psychiatric medications. SSRI medications did appear to play a significant role in determining the distribution of GAD-7 trends. The H statistic was 5.4, with 1 degree of freedom and an associated p-value of 0.020. SNRI medications did not appear to play a significant role in determining the distribution of GAD-7 trends. The H statistic was 1.5, with 1 degree of freedom and an associated p-value of 0.22. DNRI medications did not appear to play a significant role in determining the distribution of GAD-7 trends. The H statistic was 1.0, with 1 degree of freedom and an associated p-value of 0.31. TCA medications did not appear to play a significant role in determining the distribution of GAD-7 trends. The H statistic was 1.8, with 1 degree of freedom and an associated p-value of 0.18. Mood stabilizer medications did not appear to play a significant role in determining the

distribution of GAD-7 trends. The H statistic was 0.028, with 1 degree of freedom and an associated p-value of 0.86. Antipsychotic medications did not appear to play a significant role in determining the distribution of GAD-7 trends. The H statistic was 1.2, with 1 degree of freedom and an associated p-value of 0.28. Stimulant medications did not appear to play a significant role in determining the distribution of GAD-7 trends. The H statistic was 0.20, with 1 degree of freedom and an associated p-value of 0.66. Lack of psychiatric medications did not appear to play a significant role in determining the distribution of GAD-7 trends. The H statistic was 0.080, with 1 degree of freedom and an associated p-value of 0.77.

A Kruskal-Wallis chi-squared test was performed to determine whether the distribution of depression over time was different between groups on different psychiatric medications. SSRI medications did appear to play a significant role in determining the distribution of PHQ-9 trends. The H statistic was 4.3, with 1 degree of freedom and an associated p-value of 0.038. SNRI medications did not appear to play a significant role in determining the distribution of PHQ-9 trends. The H statistic was 0.17, with 1 degree of freedom and an associated p-value of 0.68. DNRI medications did not appear to play a significant role in determining the distribution of PHQ-9 trends. The H statistic was 0.45, with 1 degree of freedom and an associated p-value of 0.5. TCA medications did appear to play a significant role in determining the distribution of PHQ-9 trends. The H statistic was 4.0, with 1 degree of freedom and an associated p-value of 0.047. Mood stabilizer medications did not appear to play a significant role in determining the distribution of PHQ-9 trends. The H statistic was 0.012, with 1 degree of freedom and an associated p-value of 0.91. Antipsychotic medications did not appear to play a significant role in determining the distribution of PHQ-9 trends. The H statistic was 0.62, with 1 degree of freedom and an associated p-value of 0.43. Stimulant medications did not appear to play a significant role

in determining the distribution of PHQ-9 trends. The H statistic was 0.67, with 1 degree of freedom and an associated p-value of 0.41. Lack of psychiatric medications did not appear to play a significant role in determining the distribution of PHQ-9 trends. The H statistic was 0.029, with 1 degree of freedom and an associated p-value of 0.87.

Discussion

The percentage of patients who reported being verbally or physically abused because of their gender identity (41.4%) was lower than the percentage measured by the 2015 US Transgender Survey (54%).[1] The percentage of patients reported being accepted by their families (50%) was lower than the percentage measured by the 2015 US Transgender Survey (60%).[1] The percentage of patients who reported being unemployed (27.6%) was greater than the unemployment rate measured by the 2015 US Transgender Survey (15%).[1] The percentage of patients reported having been a victim of physical or verbal abuse (41.4%) was lower than the 2015 US Transgender Survey (46%). The percentage of patients who reported to have depression (50%) is 7.5 times the national rate (6.7%), which closely reflects the 2015 US Transgender Survey's evaluation of psychological distress in transgender people compared to the US population (7.8 times greater for transgender people).[1,24]

The results of the Wilcoxon signed rank test with continuity correction for the GAD-7 scores over time show a statistically significant downward trend ($p=0.02$), suggesting a decrease in anxiety. However, the average trend of -1.5 points over the 25-month study period represents a clinically insignificant change, as each severity level of anxiety is represented by a minimum of 4 points. This same test, when performed on the PHQ-9 scores showed no significant trend ($p=1$), suggesting no change in depression over the study period. Because this was a

retrospective study, we were unable to specifically measure dysphoria, as it was not assessed during follow-up visits. Instead, we attempted to use anxiety and depression as a proxy measurement, as these are symptoms of gender dysphoria; however, transgender people have many risk factors for anxiety and depression outside of gender dysphoria. Future work should attempt to measure gender dysphoria directly, controlling for external factors that may be responsible for persistent anxiety and depression.[1,2] We are unable to know if dysphoria improved over time with the data available from the OSUTPCC.

While the GAD7 and PHQ9 have been shown to accurately identify and measure the intensity of anxiety and depression, their efficacy in longitudinal data collection are not well known. Most of the subjects had gaps of several months between visits to the clinic. This decreases the accuracy of mental health tracking, as the GAD-7 and PHQ-9 only ask about how the subject felt over the last two weeks. Ideally, future work would assess mental health every two weeks, track which patients were receiving psychotherapy, and when patients received a gender-affirming surgery. [1]

Mental health scores collected at the first few patient visits may be falsely low. This is because fear of hormone gatekeeping by physicians and mental health professionals is still prevalent in the Transgender Community, regardless of the practices of the OSUTPCC. After patients have initiated CGHT and formed relationships with the OSUTPCC physicians, they may feel more comfortable revealing mental health issues, leading to falsely worsening mental health scores.

The lack of a control group in this study limits our ability to make claims about the efficacy of CGHT on the treatment of gender dysphoria as estimated by depression and anxiety.

Additionally, our relatively small study size reduces the likelihood that our statistically significant results reflect a true difference.

Implications

Because mental health outcomes were not meaningfully improved under the gender-affirming care of the OSUTPCC alone, the clinic intends to hire a psychologist to be available to patients and to help guide the patient-care team.

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